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ORIGINAL ARTICLE

Post-CABG guidelines directed medical therapy: Assessing compliance at Peshawar Institute of Cardiology.

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ABSTRACT... Objective: To determine the post-operative compliance with guideline directed medications following coronary artery by-pass grafting. **Study Design:** Retrospective Observational study. **Setting:** Peshawar Institute of Cardiology, KPK. **Period:** December 2020 to December 2023. **Methods:** This study included (n=2146) adults who underwent CABG surgery and their GDMT compliance was observed. Data was extracted from electronic medical record (EMR) and was evaluated by using SPSS version 26.0. **Results:** The mean age of the patients (56.821±10.1548) and mean BMI (27.8249±4.32135). Percentage of Guideline directed medical therapy utilization after coronary artery bypass grafting showed beta-blockers 97%, statin 95%, aspirin+clopidogrel to be 99%, aspirin 82%, ACEI 9% and CCB 5%. Multivariate regression model for secondary prevention in CABG, the rate of GDMT use, such as aspirin, showed a significant relationship with age ($p < 0.05$), while gender showed non significant relationship with GDMT use. Similarly, aspirin, CCB, and ACEI showed a significant relationship with family history ($p < 0.05$). **Conclusion:** The study underscores post-operative compliance with discharge medications following coronary artery bypass grafting (CABG). The findings revealed varying levels of adherence to guideline-directed medical therapies (GDMT), with several patients not fully complying with prescribed medications such as statins, beta-blockers, and aspirin.

Key words: Cardiopulmonary Bypass, Guideline Directed Medicine, Percutaneous Coronary Intervention.

INTRODUCTION

Coronary Artery Bypass Grafting (CABG) remains one of the most commonly performed procedures for the treatment of severe coronary artery disease (CAD) and aims to improve both survival and quality of life by restoring adequate myocardial perfusion. Furthermore, the advancement of CAD in either the bypass grafts or in native vessels is not prevented by CABG alone. Therefore, it's critical to understand that strong secondary prevention is necessary to reduce the likelihood of vein graft failure as well as native CAD progression.[1]

Despite its significant success in reducing mortality and alleviating symptoms, the long-term prognosis of CABG patients is closely linked to their adherence to post-operative medical therapy. This therapy typically involves a combination of antiplatelet agents, statins, beta-blockers, angiotensin-converting enzyme inhibitors (ACE inhibitors), and lifestyle modifications, which are crucial to optimize the graft patency, prevent adverse cardiovascular events, and improve overall survival rates.[2]

Post-operative compliance with these guideline-directed medical therapies (GDMT) is an essential aspect of post-CABG care, as suboptimal adherence to these therapeutic regimens is associated with higher rates of graft failure, recurrent myocardial infarction, and the need for revascularization procedures.[3] In particular, a lack of adherence to statins and antiplatelet therapies, which help reduce the risk of thrombotic events, has been identified as a significant factor contributing to poor long-term outcomes.[4]

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The challenge of ensuring optimal compliance is multifactorial, with patient-related factors such as age, comorbidities, and socio-economic status, as well as healthcare-related factors like inadequate follow-up and insufficient patient education playing important roles.[5] In addition, the recommendation for GDMT following cardiovascular procedures forecasts its use at six months; however, GDMT has mostly been ignored in patients after CABG surgery, despite reports that its usage is expanding rapidly.[6] Research has shown that patients who take half or more of the recommended GDMT after discharge have a 69% better 2-year survival rate than those who take half or less of the recommended GDMT in CABG patients. There is substantial evidence for secondary prevention in CABG patients; yet, numerous trials have shown inadequate GDMT use after CABG.[7]

Post-operative compliance with GDMT has not been extensively studied, despite the increasing prevalence of coronary heart disease (CHD) in the (KPK) region. A better understanding of the factors influencing patient adherence at PIC can help optimize post-operative care protocols and reduce the risk of recurrent cardiovascular events. Recent studies conducted globally suggest that educational interventions, improved communication between patients and healthcare providers, and culturally tailored support systems may enhance adherence rates.[5]

This study aims to evaluate the level of compliance with GDMT following CABG at the Peshawar Institute of Cardiology, investigate the barriers to adherence, and propose strategies for improving post-operative care. By addressing this critical aspect of post-CABG management, the research hopes to contribute valuable insights into improving patient outcomes and reducing the burden of cardiovascular disease in Pakistan.

METHODS

Study Sample

We included all adults (male, female) (n=2146) who were diagnosed with coronary artery disease and underwent coronary artery bypass surgery (CABG). Data was extracted retrospectively from EMR (electronic medical record). The study was carried out after IRB approval taken from the hospital's Institutional Review Board Committee (IRB) Reference No: (IRC/24/133). The trial was carried out following the Helsinki Declaration and international harmonization principles for good clinical practices.

Study Setting and Duration

This retrospective observational study was executed at the Peshawar Institute of Cardiology, KPK, from December 2020- December 2023.

Inclusion Criteria

Age > 18
On pump CABG
OPCAB

Exclusion Criteria

Age <18
Renal failure cases
Re-opening
Valvular cases

Statistical Analysis

To conduct the statistical analysis for our study SPSS version 26.0 was utilized. Descriptive statistics were used to calculate mean and ±SD e.g., Age, BMI, Blood pressure, Latest Serum Creatinine, EF %, Bypass time, cross-clamp time, and ICU stay. Inferential statistics was used to calculate frequencies and percentages e.g., gender, marital status, risk factors, clinical presentations, operation status, vessel involvement, and post-operative complications. For secondary prevention in CABG multivariate regression model for the rate of GDMT use was applied to find any significant relationship of GDMT with Age, Gender, and Family history.

RESULTS

The study included a total of 2146 patients who underwent coronary bypass surgery (CABG) after meeting the inclusion criteria.

Table-I illustrates that the mean age of the patients (56.821±10.1548), mean BMI (27.8249±4.32135), mean systolic BP (139.229±21.1566), mean

diastolic BP (80.885±13.6240). Pre-oper ative data shows mean creatinine (1.0394±3.43309) and mean ejection fraction (53.321±8.77). Intra-operative data shows mean cardiopulmonary bypass times min (89.604±50.4285) and cross-clamp times min (61.598±36.2840).

Characteristics	Mean	±SD
Age (years)	56.821	±10.1548
Pulse rate	80.79	±13.808
SBP	139.229	±21.1566
DBP	80.885	±13.6240
BMI	27.8249	±4.32135
Pre-operative data		
Creatinine	1.0394	±3.43309
Ejection Fraction	53.321	±8.7699
Intra-operative data		
Cardiopulmonary bypass time (mins)	89.604	±50.4285
Cross Clamp times (mins)	61.598	±36.2840

Table-I. Clinical baseline traits, Pre-operative and Intra-operative data of the research population (n=2146)

Variables	Frequency	%age
Gender		
Male	1724	80.3%
Female	422	19.6%
Operation Status		
Elective	2023	94.2%
Emergency	123	5.7%
CABG		
On-pump CABG	1681	78.3%
OPCAB	465	21.6%
Risk Factors		
Hypertension		
No	478	22.3%
Controlled on medication	1640	76.42%
Uncontrolled	28	1.3%
Diabetes		
No	1033	48.1%
Diet	45	2.09%
Insulin	776	36.1%
Oral therapy	292	13.6%
Smoking		
No	1286	59.9%
Ex-smoker	387	18.0%
Still smoking	473	22.8%
Family history of CAD		
No	1847	85.6%
Yes	309	14.3%
CAD Presentation		
NSTEMI	29	1.3%
STEMI	23	1.07%
Stable Angina	331	15.4%
Unstable Angina	1763	82.1%
CCS Class		
CCS II	1844	85.9%
CCS III	295	13.7%
CCS IV	7	0.32%
NYHA Class		
NYHA II	1129	52.6%
NYHA III	1007	46.9%
NYHA IV	10	0.05%
Existence of Significant CAD		
SVCAD	17	0.8%
DVCAD	223	10.39%
TVCAD	1906	88.8%
Post-operative outcomes		
Post-operative complications		
No complications	1500	69.9%
Arrhythmias	249	11.6%
Stroke	12	0.6%
Wound	55	2.6%
Bleeding	25	1.16%
AKI	220	10.3%
GI complications	25	1.16%
Pleural Effusion	15	0.69%
Mortality	45	2.09%
Characteristics	Mean	±SD
ICU- stay (Hrs.)	29.416	±12. 8831
Ventilation time (Hrs.)	5.54	±0.98
Hospital-stay (Days)	4.795	±.9487

Table-II. Demographic profile, operation status, risk factors, family history, CAD presentations of the patients, and postoperative outcomes (n=2146)

Table-II manifest that patients underwent (CABG) included 80.3% male and 19.6% female, 94.2% of the operations were elective and 5.7% were emergency cases. On pump CABG accounted for 78.3% vs 21.6% OPCAB. Hypertensive patients controlled on medication 76.42%, uncontrolled 1.3%, Diabetic patients on insulin 36.1%, oral therapy 13.6%and on diet 2.09%, followed by ex-smoker 18.0%, still smoking 22.8%. Family history showed 14.3% of the cases had family history. CCS class shows that most patients were CCS-II 85.9% after that CCS-III 13.7% respectively. NYHA class shows that most of the patient were NYHA-II 52.6%, NYHA-III 46.9%, NYHA-IV 0.05%. CAD presentations illustrated that most of the patients presents were with unstable angina 82.1.1%, stable angina 15.4% STEMI 1.07% and NSTEMI 1.3%. Existence of significant CAD showed: Triple vessel disease was the most prevalent one in patients who underwent (CABG) 88.8%, double vessel disease 10.39% and single vessel disease 0.8% respectively. Post-operative outcomes show that no complications were recorded in (69.9%), Arrythmias (11.6 %), stroke (0.6%) Wound (2.6%), bleeding (1.16%) AKI (10.3%), GI complications (1.16%), Pleural effusion (0.69%) and mortality (2.09%). Similarly mean ICU-stay (29.416±12.8831), ventilation time (5.54±0.98) hours and mean hospital stay (4.795±.9487).

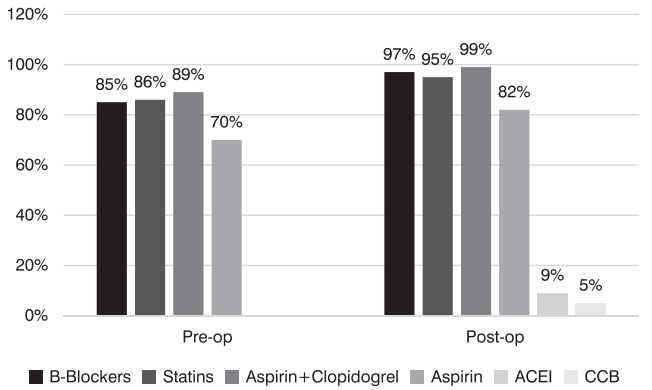

Figure-1. Percentage of Guideline directed medical therapy utilization pre and post coronary Artery bypass grafting

Table-III presents the multivariate regression analysis for secondary prevention in CABG, showing the odds ratios (OR) and p-values for the use of guideline-directed medical therapies (GDMT) based on age, gender, and family history. The table highlights significant factors influencing GDMT use, including statins, ACE inhibitors, and aspirin, with corresponding p-values indicating their statistical significance at $p<0.05$.

Factor	GDMT	OR	[95% CI]	P-Value
Age	B-Blockers	1.00	0.99-1.02	0.2
	Aspirin	1.004	0.99-1.01	0.5
	Calcium channel blocker	1.014	0.99-1.04	0.17
	Statin	1.18	1.07-1.29	0.001
	ACE Inhibitors	1.014	1.0-1.03	0.057
	Aspirin+Clopidogrel	1.00	0.99-1.03	0.4
Gender	B-Blockers	0.97	0.7-1.4	0.9
	Aspirin	0.78	0.58-1.05	0.09
	Calcium channel blocker	1.052	0.64-1.73	0.9
	Statin	0.537	1.06-2.705	0.46
	ACE Inhibitors	1.00	0.68-1.49	0.97
	Aspirin+Clopidogrel	0.78	0.53-1.2	1.6
Family History	B-Blockers	1.3	0.89-1.7	0.0
	Aspirin	2.1	1.58-2.9	0.00
	Calcium channel blocker	2.18	1.10-4.33	0.025
	Statin	2.43	0.58-10.10	0.22
	ACE Inhibitors	1.63	1.021-2.62	0.04
	Aspirin+Clopidogrel	1.39	0.96-2.0	0.07

Table-III. For secondary prevention in CABG multivariate regression model for the rate of GDMT use

DISCUSSION

The study on post-operative compliance with guidelines directed medical therapy (GDMT) following coronary artery bypass grafting (CABG) at the Peshawar Institute of Cardiology sheds light on crucial aspects of cardiac care. One of the key findings is the increasing complexity of patients undergoing CABG, with a rising burden of cardiac and non-cardiac comorbidities. This complexity not only impacts the surgical outcomes but also emphasizes the need for effective secondary prevention strategies to improve long-term prognosis.[8]

This aligns with findings from Jalloh et al. (2023), who also reported a rise in comorbidities in CABG patients, particularly in the elderly, which correlated with poorer outcomes and necessitated more robust post-operative management strategies.[9]

The use of GDMT for secondary prevention in patients following coronary artery revascularization surgery is covered in this study. Additionally, it evaluated the risk variables for CABG patients' underutilization of GDMT. Our findings indicate that patients undergoing cardiac revascularization surgery are discharged from GDMT in the most efficient manner but despite the established benefits of GDMT several gaps and challenges exist in its implementation. For instance, 3% of the Post-operative CABG patients did not receive betablockers, 5% did not receive statins and 18% did not receive aspirin therapy. When comparing this study's findings with international study findings by Alburikan et al. (2017) it highlights that although GDMT is widely recommended, there is a significant gap in its implementation. A substantial proportion of post-CABG patients did not receive the full set of guideline-recommended therapies similar to what was observed in Alburikan's cohort, where 15% of patients were not fully compliant with GDMT despite clear guidelines. Factors influencing this underutilization include variations in clinical practice, healthcare system limitations, and possible barriers such as physician non-compliance and patient factors.[7,10]

Additionally, ACE inhibitors were recommended among patients with left ventricular ejection fraction < 40%, diabetes mellitus, recent myocardial infarction, and/or chronic kidney disease). However, many patients did not receive all recommended medications postoperatively. According to previous literature, because of the variation in practice patterns among individual clinicians and systemic issues, such as lack of access to consults, insufficient staff training on GDMT protocols, or limitations in electronic health record prompts, can lead to inconsistent application of GDMT.[11] In a study by Kulik et al. (2008), it was noted that variations in clinical practice, particularly in smaller healthcare settings, often resulted in ACE inhibitors being underutilized despite their demonstrated benefits in post-CABG patients.[12]

Analyzing the demographic profiles, pre-operative, intra-operative, and post-operative outcomes of CABG patients provides valuable insights into the challenges and opportunities in cardiac care. Factors such as age, gender, and family history influence GDMT adherence, highlighting the need for personalized treatment approaches[5] In the study the rate of GDMT use did not change with gender ruling out disparity in patient care based on gender. However, the rate of GDMT use did not change with age except statin which showed a significant relationship with age at $p<0.01$. The study by Fleg et al (2013) showed that older age was a significant determinant for receiving statin therapy post-CABG, with a positive correlation between age and statin prescription.[13] This is due to the fact as individual age, many physiological changes occur in the body, one of which includes changes in the cholesterol level. The main relevance of cholesterol is related to its involvement in atherosclerosis, a degenerative process affecting medium and large size arteries that accounts for most cardiovascular illnesses (CVD), the world's leading cause of mortality.[14] Similarly, the rate of GDMT use such as (ACE inhibitor Aspirin and Ca channel blocker) showed significant relation at $p<0.05$ with family history in the study. According to previous studies, people with a high cardiovascular risk profile, such as those who have a family history of cardiovascular disease (CVD), benefit most from ACE inhibitors. Aspirin is frequently used for CVD (primary and secondary) prevention, especially those at a high risk of cardiovascular with a family history of heart disease, are acknowledged to benefit from it.[15] For example, the European Society of Cardiology states that in individuals with diseases including hypertension, diabetes, and heart failure, ACE inhibitors considerably lower the risk of cardiovascular events. Similarly, calcium channel blockers are useful in the treatment of angina and hypertension, two disorders that are frequently present in people with a family history of cardiovascular disease. This was corroborated by a study by Thompson et al. (2018), which showed that CCB use in post-CABG patients with hypertension significantly reduced the occurrence of adverse

cardiovascular events.[16] The European Society of Cardiology states that CCBs are an essential part of a hypertensive patient's treatment plan since they successfully control blood pressure, which lowers the risk of cardiovascular events.[17]

While GDMT is crucial for secondary prevention following CABG, our study reveals a gap in its implementation. This gap is also echoed in the study by Baryakova et al. (2023), who highlighted similar barriers to adherence, including healthcare provider training deficits and patient-related challenges such as medication non-compliance and socio-economic factors.[18] This gap underscores the need for continuous medical education, enhanced healthcare provider training, and the establishment of standardized protocols to ensure better adherence to GDMT. According to previous study improving the education of healthcare providers and the implementation of clear, standardized treatment protocols have shown promise in closing the gap between guidelines and clinical practice, leading to better patient outcomes in post-CABG care.[19] Furthermore, improving patient awareness and involvement in the decision-making process is essential for achieving better long-term outcomes. Addressing these barriers will be key to bridging the gap between evidence-based guidelines and clinical practice, ultimately improving patient outcomes post-CABG.

CONCLUSION

In conclusion, this study highlights the importance of post-operative compliance with discharge medications following coronary artery bypass grafting (CABG). Ensuring adherence to guideline-directed medical therapies (GDMT) plays a pivotal role in improving long-term outcomes for CABG patients. The findings underscore the need to address barriers such as socio-economic factors, patient education, accessibility to medications, and healthcare support systems. Furthermore, the implementation of structured long-term follow-up programs is essential to monitor and enhance compliance with GDMT, thereby optimizing post-operative care and improving patient outcomes. Bridging the gap between guideline recommendations and clinical practice remains crucial for achieving the best possible results in post-CABG care.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Colmenarez H, Escaned J. **The distinct role of secondary prevention in patients with prior coronary interventions.** EuroIntervention. 2009 May 1; 5(suppl D):D131-8.

2. Lazar HL. **The surgeon's role in optimizing medical therapy and maintaining compliance with secondary prevention guidelines in patients undergoing coronary artery bypass grafting.** The Journal of Thoracic and Cardiovascular Surgery. 2020 Sep 1; 160(3):691-8.

3. Thuan PQ, Chuong PTV, Nam NH, Dinh NH. **Coronary artery bypass surgery: Evidence-based practice.** Cardiol Rev (2023) doi:10.1097/crd.0000000000000621.

4. Lansberg P, Lee A, Lee ZV, Subramaniam K, Setia S. **Nonadherence to statins: Individualized intervention strategies outside the pill box.** Vascular Health and Risk Management. 2018; 14:91-102. Preprint at https://doi.org/10.2147/VHRM.S158641.

5. Khanderia U, Townsend KA, Erickson SR, Vasnik J, Prager RL, Eagle KA. **Medication adherence following coronary artery bypass graft surgery: Assessment of beliefs and attitudes.** Annals of Pharmacotherapy. 2008; 42:192-99.

6. Moshkovitz Y, Orenstein L, Olmer L, Laufer K, Ziv A, Dankner R. **Emulated trial for discharge prescription of guideline-directed medical therapy and 15-year survival after coronary artery bypass graft surgery.** Mayo Clin Proc. 2024; 99:766-79.

7. Alburikan KA, Nazer RI. **Use of the guidelines directed medical therapy after coronary artery bypass graft surgery in Saudi Arabia.** Saudi Pharmaceutical Journal. 2017; 25:819-22.

8. Sung LC, Chang CC, Yeh CC, Cherng YG, Chen TL, Liao CC, et al. **How long after coronary artery bypass surgery can patients have elective safer non-cardiac surgery?** J Multidiscip Healthc. 2024; 17:743-52.

9. Jalloh MB, Averbuch T, Kulkarni P, Granger CB, Januzzi JL, Zannad F, et al. **Bridging treatment implementation gaps in patients with heart failure: JACC Focus Seminar 2/3.** Journal of the American College of Cardiology. 2023 Aug 8; 82(6):544-58.

10. Wang T, Tan JY, Liu XL, Zhao I. **Barriers and enablers to implementing clinical practice guidelines in primary care: An overview of systematic reviews.** BMJ Open. 2023 Jan 1; 13(1):e062158.

11. Attafuah PYA, Abor PA, Abuosi AA, Nketiah-Amponsah E, Tenza IS. **Satisfied or not satisfied? Electronic health records system implementation in Ghana: Health leaders' perspective.** BMC Med Inform Decis Mak. 2022; 22(1):249.

12. Kulik A, Brookhart MA, Levin R, Ruel M, Solomon DH, Choudhry NK. **Impact of statin use on outcomes after coronary artery bypass graft surgery.** Circulation. 2008 Oct 28; 118(18):1785-92.

13. Fleg JL, Forman DE, Berra K, Bittner V, Blumenthal JA, Chen MA, et al. **Secondary prevention of atherosclerotic cardiovascular disease in older adults: A scientific statement from the American Heart Association.** Circulation. 2013 Nov 26; 128(22):2422-46.

14. Félix-Redondo FJ, Grau M, Fernández-Bergés D. **Cholesterol and cardiovascular disease in the elderly. Facts and Gaps.** Aging Dis. 2013; 4(3):154-69.

15. Kim JH, Shim MJ, Lee SY, Oh J, Kim SH. **Aspirin for primary prevention of cardiovascular disease.** Journal of Lipid and Atherosclerosis. 8:162-72. Preprint at https://doi.org/10.12997/jla.2019.8.2.162 (2019).

16. Jones KE, Hayden SL, Meyer HR, Sandoz JL, Arata WH, Dufrene K, et al. **The evolving role of calcium channel blockers in hypertension management: Pharmacological and clinical considerations.** Current Issues in Molecular Biology. 2024 Jun 22; 46(7):6315-27.

17. Ko D, Azizi P, Koh M, Chong A, Austin P, Stukel T, et al. **Comparative effectiveness of ACE inhibitors and angiotensin receptor blockers in patients with prior myocardial infarction.** Open Heart. 2019; 6(1):e001010.

18. Baryakova TH, Pogostin BH, Langer R, McHugh KJ. **Overcoming barriers to patient adherence: The case for developing innovative drug delivery systems.** Nature Reviews Drug Discovery. 2023 May; 22(5):387-409.

19. Zhang Z, Wang C, Tu T, Lin Q, Zhou J, Huang Y, et al. **Advancing guideline-directed medical therapy in heart failure: Overcoming challenges and maximizing benefits.** American Journal of Cardiovascular Drugs. 2024 May; 24(3):329-42.

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2	**Kiran Jamal:** Write up and data analysis.
3	**Hira Hameed:** Data collection.
4	**Muhammad Bilal ud Din:** Data collection.
5	**Waqar Masud Malik:** Critical review, write up.